


New documents

ГОСУДАРСТВЕННАЯ КОРПОРАЦИЯ ПО АТОМНОЙ ЭНЕРГИИ «РОСАТОМ»

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**СТРАТЕГИЯ
СОЗДАНИЯ ПУНКТА ГЛУБИННОГО ЗАХОРОНЕНИЯ
РАДИОАКТИВНЫХ ОТХОДОВ**

Москва
2018

State Corporation for Atomic Energy “Rosatom”

Approved Director General
of State Corporation
for Atomic Energy “Rosatom”
A. E. Likhachev,
28 March 2018

Strategy of Development of a Deep
Radioactive Waste Disposal Facility

Moscow 2018

1. Purpose

Strategy of development of a deep radioactive waste disposal facility (hereafter referred to as Strategy) is a public document reflecting the vision of State Corporation "Rosatom" regarding:

- Conditions and methods for resolution of the national problem of development of a complex infrastructure facility of USS RW.
- Conditions affecting interdivisional interaction within the State Corporation "Rosatom" regarding development of technologies which may potentially lead to generation of radioactive waste of 1 and 2 classes.
- Priorities and contents of long-term activities of FSUE "NO RW" on development of a deep RW disposal facility in Nizhnekansk massif.

2. Basis for development and implementation

The current Strategy was developed in the framework of implementation of the authority and functions of the State management body in the field of radioactive waste (RW hereafter) management by State Corporation "Rosatom" on the basis of part 1, 6 and 27 of article 7 of the Federal Law of 01.12.2007 No.317-FZ "On the State Corporation for atomic energy "Rosatom".

Development and implementation of the Strategy are based on:

- Federal Law of 11 July 2011 No.190-FZ "On the management of radioactive waste and amendment of separate legal acts of the Russian Federation".
- Resolution of the Government of the Russian Federation of 19.11.2015 No.1248 on approval of the Federal targeted program "Assurance of nuclear and radiation safety for 2016–2020 and for the period up to 2030" in the part regarding implementation of action 2.1 "Construction of final isolation facility for radioactive waste of 1st and 2nd classes (deep radioactive waste disposal facility, Krasnoyarsk Kray, Nizhnekansk massif), including the 1st batch".
- Resolution of the Government of the Russian Federation of 19.11.2012 No.1185 "On determination of the procedure and timeline of establishment of the unified state system for management of radioactive waste", which envisages commissioning of facilities of underground research laboratory to carry out research confirming the safety of establishment of deep disposal facility for high level radioactive waste.

Clauses of chapter 3 "Safety of radioactive waste management" of the Joint Convention on Radioactive Waste on the Safety of Spent Fuel Management and the Safety of Radioactive Waste Management" (entered into force for the Russian Federation on 19 April 2006).

3. Developers

The Strategy was developed by FSUE "NO RW", IBRAE RAN and Project Office "Establishment of unified state system of RW management" of the

State Corporation "Rosatom" under initiative of the Director for state policy in the field of RW, SNF, and NRHF decommissioning of State Corporation "Rosatom" O. V. Kryukov.

Results of the following R&D works were used in development of the Strategy:

- on selection and justification of the site for deep radioactive waste disposal facility (hereafter referred to as DRWDF);
- safety case for siting and construction of DRWDF;
- justification of technologies, equipment design, design solutions and safety of facilities at DRWDF site;
- engineering and geological surveys. The Strategy takes full account of the obligations of the Russian Federation on fulfillment of the "Joint Convention for the Safety of SNF management and safety of RW management" and best international practices of DRWDF development.

The Strategy was reviewed and approved at the joint meeting of scientific and technical council No.5 "Closing stage of the nuclear fuel cycle" and No. 10 "Environmental, nuclear and radiation safety" of the State Corporation "Rosatom" (27.10.2017).

4. Purpose and characteristics of constructed facilities

DRWDF (deep radioactive waste disposal facility) – "facility for disposal of radioactive waste, including a structure located at the depth of more than a hundred meters under the surface" envisaged by the Federal Law of 11.07.2011 No.190-FZ (edition of 02.07.2013);

URL (underground research laboratory) – underground facility where activities are carried out on characterization, testing, demonstration, justification and verification of specially developed technologies in support of DRWDF development.

The developed facility, including surface site, URL and DRWDF structures are intended for disposal of accumulated (federal property) and newly generated (property of operators) RW of 1 and 2 classes.

Development of an underground research laboratory precedes the stage of site operation as a deep RW disposal site.

5. Funding Sources

The main funding sources for implementation of the Strategy are:

- for disposal of accumulated RW – federal budget funds allocated in the framework of the federal targeted program "Nuclear and radiation safety assurance for 2016–2020 and for the period up to 2030" approved by the Decree of the Government of the Russian Federation of 19.11.2015 No. 1248.
- for disposal of newly generated RW – special reserve fund of the State Corporation "Rosatom" No.5 "RW management". USS RW (in particular, the system of state accounting and control of RM and RW and disposal fees) will ensure coordination

of the interests of the Russian Federation and the State Corporation "Rosatom" in process of RW allocation for disposal by applying a system approach to taking into account the needs and capabilities with regards to RW scope.

6. Main participants of Strategy implementation

Government of the Russian Federation in the part of realization of authorities set out in the Federal law of 11.07.2011 No.190-FZ.

Management bodies of State Corporation "Rosatom" (Supervisory Board, Management Board, Director General and his deputies) - in the part of adoption of Strategy for the long-term period, administration of funding of DRWDF development out of a special reserve RW management fund of the State Corporation "Rosatom" and consideration of other issues in accordance with their authority.

Director for State Policy in the field of SNF and RW management and decommissioning of State Corporation "Rosatom" — Strategy supervisor.

Project Office "Establishment of USS RW" — in the part of coordination of formation of Strategy budget and monitoring of its implementation; acting as a functional customer for research in support of Strategy implementation, including in the part of RW preparation for decommissioning.

FSUE "NO RW" — implementation of the Strategy, including in the part of construction, operation and closure of DRWDF.

Relevant Scientific and Technical Councils of the State Corporation "Rosatom" (STC No.10 "Environmental, Nuclear and Radiation Safety" and STC No.5 "Closing stage of the nuclear fuel cycle") — scientific expertise of the technology, research program and other decisions made in the framework of the Strategy.

Operators which generated or are generating RW of 1 and 2 classes.

State regulatory bodies in the field of use of nuclear energy — in the part of authorities set out by the Federal laws of 11.07.2011 No.190-FZ and of 21.11.1995 No.170-FZ;

Citizens and public organizations, including international organizations.

The following shall be defined for implementation of the Strategy:

- Head scientific organization, head project organization, head designer, head technologist.
- Management structure in the framework of organization and management programs and projects of State Corporation "Rosatom".

7. Main phases and program instruments of Strategy implementation

The project is implemented in a stepwise manner. Phase duration may vary depending on newly identified geological, hydrological, infrastructure and other types of information.

- Phase No.1 "Preliminary works for establishment of URL". Duration — up to 5 years. (2017 — 2021).
- Phase No.2 "Construction of demonstration centre and main structures of URL". Duration — up to 5 years.
- Phase No.3 "Operation and development of URL". Duration — up to 5 years and more.
- Phase No.4 "Making a decision on the possibility of DRWDF construction. Licensing of activities on DRWDF construction. Implementation of measures on construction of the 1st batch of DRWDF". Duration — up to 5 years and more.
- Phase No.5 "Operation of first batch of DRWDF and URL". Duration — up to 30 years and more.
- Phase No.6 "Closure of first batch of DRWDF". Duration — up to 5 years and more.

Main activities of the Strategy for the period of 2017—2030 are implemented in the framework of the Federal Targeted Program "Nuclear and radiation safety assurance for 2016—2020 and for the period up to 2030" the part regarding implementation of action 2.1 "Construction of final isolation facility for 1 and 2 classes radioactive waste (deep radioactive waste disposal facility, Krasnoyarsk Kray, Nizhnekansk massif), including the first batch", extended action 8 "Safe removal of radioactive waste from storage facilities, preparation for disposal, and disposal, and action 12.2 "Development of technologies for reprocessing and conditioning of radioactive waste".

The following programs are also planned for development and implementation:

- Strategic Master-Plan for R&D demonstrating the safety of construction, operation and closure of a DRWDF — a comprehensive program of research in support of long-term safety case of RW disposal and optimization of operational parameters of the facility (to be reviewed and approved) — funded by the funds of FTP NRS-2 and other sources.
 - Program of research at URL — list of experiments planned for implementation at URL with detailed description of expected results (to be developed); development and implementation is funded from the funds of FTP NRS-2, by FSUE "NO RW" and other sources.
 - Programs for preparation of 1 and 2 class RW to disposal at DRWDF — program of practical works on bringing RW into compliance with the acceptance criteria to be developed by the operators in coordination with FSUE "NO RW"; to be funded out of the funds of FTP NRS-2 (accumulated RW) and organizations producing RW (newly generated RW).
 - Program of transportation of 1 and 2 class RW for disposal at DRWDF — quarterly program of RW transportation for disposal to be developed by the national operator and project office on establishment of USS RW; to be funded out of the funds of FTP NRS-2 (accumulated RW) and organizations producing RW (newly generated RW).
- "Safety case report" is issued at each phase of the works and at specific significant stages of works. The Report shall take into the development of regulatory requirements, changes of projected volumes of RW

generations and RW parameters, as well as other infrastructure features of Strategy implementation.

8. Specification of the Strategy

The Strategy is to be reviewed and, if necessary, corrected at least once per 5 years with account for the progress of phases implementation, and in accordance

with state objectives in the field of nuclear and radiation safety, including in 2020, 2025, 2030.

Specific aspects of the Strategy, including duration of phase implementation, may be reviewed on a more frequent basis due to the strong dependence of safety case on new information, change of funding allocation and other causes and may be identified by separate documents.

9. Plan of works for separate phases

Phase No. 1 "Preliminary works for establishment of URL"

Measures and actions	Key result of phase implementation	Document reflecting the key result
Management system and human resources*	All components of the management system have been identified, including: establishment of Management Council, selection of head project organization, head designer and scientific supervisor. Establishment at FSUE "NO RW" of a Project office on establishment of RW disposal facility and a scientific section	Approved membership and regulations of the Management council Approved regulations of the Head project organization, Head designer and Scientific supervisor
Research and development on safety case	Approved Strategic master-plan for long-term safety case development, including the general program of research at URL. Justified recommendations on optimization of the project Stepwise preparation of a detailed program of research at URL (specification of input data and requirements to the experiments) and a comprehensive monitoring program (radiation, hydrogeological, climatic, etc.). Specified disposal concept	Strategic master plan for long-term safety case development
Design and engineering	Developed Terms of reference for correction of design and estimate documentation. Preparation of input data for development of working documentation with correction of design solutions. Correction of design documentation for construction of URL and DRWDF, Head State Expertise of design documentation. Main design solutions for underground structures are optimized and supported by design and estimate and engineering documentation	Design and engineering documents
Practical works at the site	Supporting surface structures for URL are constructed in accordance with the approved design documentation. Commissioning of supporting surface facilities, issue of the "Conclusion on compliance of construction facility to the requirements of regulatory and design documentation". Hydrological, hydrogeological, geodynamic, seismic and radiation monitoring systems are functioning at the site. System of construction energy supply is functioning	Form of completed works of capital construction
RW preparation for disposal.	All organizations – sources of RW of 1 and 2 classes for long-term period are determined. Specification of RW acceptance criteria	Report "Sources and parameters of RW of 1 and 2 class planned for disposal at the facility"
Interaction with stakeholders**	<ul style="list-style-type: none"> Issue of specialized scientific and technical journal "Radioactive waste" is organized to publish general data on the safety of the facility. Project progress reports – annually Discussion of the report with public, including local communities of Krasnoyarsk and/or Zheleznogorsk. Information on implementation of the Strategy is presented at the Meeting of the Contracting parties of the Joint Convention. Conduct of 1st International conference for the problem of construction and safety case development of deep RW disposal facility in Nizhnekansk massif 	6th National report.

Note * – Management system remains functional until the moment of DRWDF commissioning.

Note ** – interaction with stakeholders in a similar manner is carried out at all phases of the current plan.

Phase No. 2 “Construction of demonstration-research centre and URL”

Measures and actions	Key result of phase implementation
Management system and human resources	Knowledge management system for Nizhnekansk massif has been designed. Preparation of personnel to work at URL, including at the structures of the surface demonstration and research centre
Research and development on safety case	Detailed program of research at URL is developed, all URL facilities, research conditions and results forecasts for 10–15 years are justified. Long-term safety case complying to international recommendations is developed. RW acceptance criteria are justified. Disposal concept is specified.
Measures and actions	Key result of phase implementation
Design and engineering	Main design solutions for URL are optimized and supported by design and estimate and engineering documentation
Practical works at the site	Demonstration-research centre and URL are commissioned. Specific experiments are started at URL; comprehensive monitoring program is being implemented. Equipment and operations on RW management are being tested at the surface demonstration and research centre. URL shafts and boreholes drilled
RW preparation for disposal	Programs for RW preparation for disposal are developed at all organizations - sources of RW of 1 and 2 classes.
Interaction with stakeholders**	Activities of Phase 1. Establishment of an information centre in Krasnoyarsk. An application for an international peer review of the strategic plan of actions is prepared (either in the form of IAEA peer review mission or ARTEMIS service). Long-term safety case presented for international review

Phase No. 3 “Construction of demonstration-research centre and URL”

Measures and actions	Key result of phase implementation
Management system and human resources	Training of process personnel at the structures of surface DRC for operations at URL and DRWDF.
Research and development on safety case	Conduct, analysis and supervision of research at URL. Development of the safety case with account for the results of research at URL and recommendations of the international expertise. Generalization of research results. Disposal concept is specified
Design and engineering	Author supervision of the design of RW disposal facility
Practical works at the site	Operation of URL. Implementation of comprehensive monitoring program
RW preparation for disposal	Implementation of the program of RW preparation at organizations of the State Corporation “Rosatom”, including development of transport procedures. Establishment of quality assurance programs on compliance to the RW acceptance criteria. Assessment of RW compliance to the acceptance criteria.
Interaction with stakeholders	Activities of Phase 1. Public expertise of safety of the facility. Report of the international peer review of the DRWDF long-term safety case received.

Phase No. 4 “Decision-making and implementation of actions on construction of 1st batch of DRWDF (purpose may be specified based on the result of works at URL); licensing of URL transformation to DRWDF and its operation”

Measures and actions	Key result of phase implementation
Management system and human resources	Training of process personnel for operations at URL and DRWDF. Certification of DRWDF personnel.
Research and development on safety case	Analysis and supervision of research at URL. Development of the safety case with account for the results of research at URL. Preparation of documentation (safety case and environmental impact report) for submission to regulatory bodies in an application for a license for commissioning of RW disposal facility. Specified disposal concept
Design and engineering	Author supervision of the design of RW disposal facility. Decision-making on construction of the 1st batch of DRWDF
Practical works at the site	Operation of URL. Construction of the 1st batch of DRWDF. Implementation of comprehensive monitoring program. Determination of the plan of first batch of works on RW acceptance for disposal.
RW preparation for disposal	Implementation of the program of RW preparation at organizations of the State Corporation “Rosatom”. Development of a plan of transportation of RW of the first batch for disposal. Testing of the system of RW containers preparation at the facilities and transportation.
Interaction with stakeholders	Activities of Phase 1

Phase No. 5 “Operation and development of 1st batch of DRWDF”

Measures and actions	Key result of phase implementation
Management system and human resources	Modification of the Management system with account for start of operational activity of disposal facility operator
Research and development on safety case	Continuation of specific experiments at URL (including new backfilling materials, new requirements to experimental conditions, etc.). Works on closure safety case with account for operational data. Maintenance and conservation of knowledge of the facility. Monitoring activities, including radiation, hydrogeological, climatic monitoring, etc.
Design and engineering	Author supervision of the design of RW disposal facility. Decision-making on closure of the 1st batch of DRWDF.
Practical works at the site	Operation of the 1st batch of DRWDF. Implementation of comprehensive monitoring program. RW placement at the disposal chambers of the 1st batch of DRWDF.”
RW preparation for disposal	Program development with account for newly generated RW. Preparation of containers with RW at the facilities of State Corporation “Rosatom”, accompanying documents, transportation of RW of the 1st batch
Interaction with stakeholders	Activities of Phase 1

Phase No. 6 “Closure of first batch of DRWDF”

Measures and actions	Key result of phase implementation
Management system and human resources.	–
Research and development on safety case.	Additional studies. Conservation of knowledge of the facility.
Design and engineering.	Developed decisions and design for facility closure (first batch), closure licensing.
Practical works at the site	Implementation of completion operations for conservation of structures and closure of the 1st batch of DRWDF. Closure of the 1st batch of DRWDF. Implementation of comprehensive monitoring program
RW preparation for disposal.	–
Interaction with stakeholders.	Activities of Phase 1.

10. Impact on development of SC “Rosatom”

Construction of a USS RW infrastructure facility — deep disposal facility for RW of 1 and 2 class will end further accumulation of RW of 1 and 2 class at the organizations of State Corporation “Rosatom” and allow freeing up the capacities of temporary 1 and 2 class RW storage facilities.

Competitive ability of SNF reprocessing services will increase.

Russian Federation will become one of two countries in the world having comprehensive and complete infrastructure of a closed nuclear fuel cycle.

There would be a multiplicative effect of development of innovative solutions and technologies due to portfolio of orders of unique technological solutions.

Additional measures on public communication, besides those included in the Strategy, may be required.